

## Isotopes of Interest: Properties and Treatment

Isotope Name & Symbol	Ionizing Radiation Type	Radiological Half-life	Biological Half-life (days)	Exposure Type	Mode of Contamination	Focal Accumulation in Body	Treatment
Americium (Am-241)	$\alpha$	458 years	73,000	Internal	Inhalation, skin wounds	Lungs, liver, bones, bone marrow	Chelation with DTPA <sup>2</sup>
Californium (Cf-252)	$\alpha, \gamma$	2.6 years		Internal	Lungs, GI tract	Bone, liver	Chelation with DTPA <sup>2</sup>
Cesium (Cs-137)	$\beta, \gamma$	30 years	70	External, Internal	Lungs, GI tract, wounds, follows potassium	Renal excretion	Ion exchange with Prussian blue <sup>2</sup>
Cobalt (Co-60)	$\beta, \gamma$	5.26 years	9.5	External, Internal	Lungs	Liver	Gastric lavage; Limited animal data suggest that DTPA, EDTA, L-cysteine, NAC (N-Acetyl-Cysteine), and glutathione may be effective in increasing urinary excretion. <sup>3</sup>

Curium (Cm-244)	$\alpha$ , $\gamma$ , neutron	18 years	7300 (liver) 18,250 (bones)	Internal	Inhalation, GI tract	Liver, bones (soluble Cm compounds)	Chelation with DTPA <sup>2</sup>
Iodine (I-131)	$\beta$ , $\gamma$	8.1 days	138	Internal	Inhalation, GI tract, wounds	Thyroid	Potassium iodide <sup>2</sup> , propylthiouracil <sup>1</sup> , methimazole <sup>1</sup> , sodium iodide <sup>1</sup>
Iridium (Ir-192)	$\beta$ , $\gamma$	74 days	50	External, internal	Not available	Spleen	Not available
Phosphorus (P-32)	$\beta$	14.3 days	1155	Internal	Inhalation, GI tract, wounds	Bones, bone marrow, rapidly replicating cells	Lavage, Aluminum hydroxide <sup>1</sup> , Dibasic phosphates <sup>1</sup>
Plutonium (Pu-239)	$\alpha$	$2.2 \times 10^4$ years	73,000	Internal	Limited lung absorption, high retention	Lung, bones, bone marrow, liver, gonads	Chelation with DTPA <sup>2</sup>
Polonium (Po-210)	$\alpha$	138.4 days	60	Internal	Inhalation, GI tract, wounds	Spleen, kidneys, lymph nodes, bone marrow, liver, mucus lining cells of the lung	Lavage, Dimercaprol <sup>1</sup>

Radium (Ra-226)	$\alpha$ , $\beta$ , $\gamma$	1602 years	16,400	External, Internal	GI tract	Bones	MgSO <sub>4</sub> lavage <sup>1</sup> , Ammonium chloride <sup>1</sup> , Calcium <sup>1</sup> , Alginates <sup>1</sup> , Calcium gluconate <sup>1</sup>
Strontium (Sr-90)	$\beta$	28 years	18,000	Internal	Moderate GI tract	Bones - similar to calcium	Stable strontium <sup>1</sup> , Calcium <sup>1</sup> , Ammonium chloride <sup>1</sup> , Calcium gluconate <sup>1</sup> , Sodium alginate <sup>1</sup> , Aluminum-containing antacids <sup>1</sup>
Thorium (Th-232)	$\alpha$	$1.41 \times 10^{10}$ years	8,030 (bones) 700 (liver, total body)	Internal	Inhalation, GI tract	Bones	Chelation with DTPA <sup>2</sup>
Tritium (H-3)	$\beta$	12.5 years	12	Internal	Inhalation, GI tract, wounds	Total body	Dilution with controlled water intake, Diuretics

Uranium (U-235)	$\alpha$ , $(\alpha, \beta, \gamma)$	$7.1 \times 10^8$ years	15	Internal	GI tract	Kidneys, bones	Sodium bicarbonate <sup>1</sup>
Yttrium (Y-90)	$\beta$	64 hours		Internal	Inhalation, GI tract	Bones	Chelation with DTPA <sup>2</sup>

1 Not FDA approved for this indication / Off-label use

2 FDA approved for this indication

3 References:

- Llobet JM, Domingo JL, Corbella J. Comparison of antidotal efficacy of chelating agents upon acute toxicity of Co(II) in mice. Res Commun Chem Pathol Pharmacol. 1985 Nov;50(2):305-8. [PubMed Citation]
- Llobet JM, Domingo JL, Corbella J. Comparison of the effectiveness of several chelators after single administration on the toxicity, excretion and distribution of cobalt. Arch Toxicol. 1986 Apr;58(4):278-81. [PubMed Citation]
- Generic procedures for medical response during a nuclear or radiological emergency (PDF - 2225 KB) (IAEA April 2005)